



Smart Grid Nessum Applications

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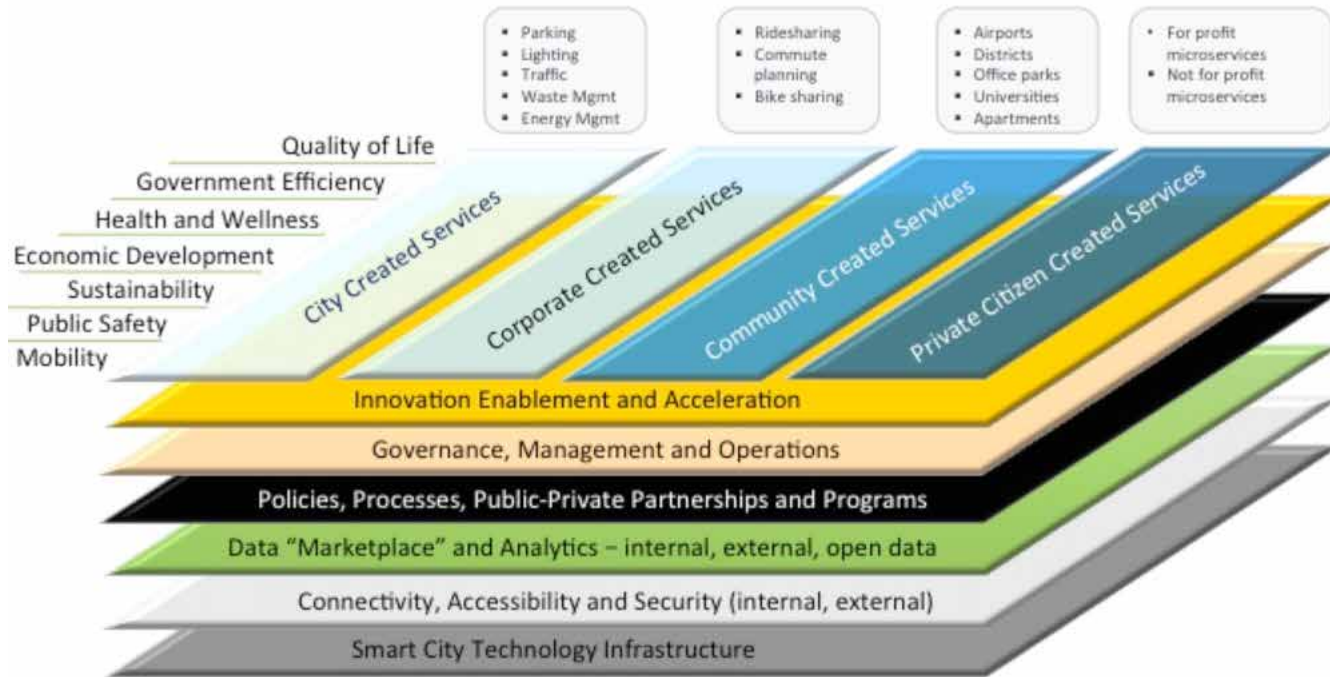
GE Vernova



Agenda

- ▶ Smart City- Concept
- ▶ Smart City Indian Context
- ▶ Communication For Smart cities
 - Communication Requirement
 - Challenges in communication
 - PLC Nessum Technology Value propositions
 - Functional
 - Commercial
 - Technology
 - Solutions based upon Nessum Technology

Smart City Concept



Source: StrategyofThings.io

Smart City India Perspective



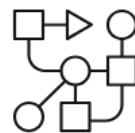
SMART CITY - USE CASES AND APPLICATIONS

| Public services | Transportation | Public safety |
|--|---|---|
| Citizen services Tourist services Public transportation Identity & administration Information services | Smart roads Connected vehicle Smart parking Smart traffic Noise and pollution | Smart lighting Environment Asset tracking Video surveillance Emergency response |
| Sustainability | Integrated smart functions | Infrastructure |
| Environment monitoring Smart waste management Smart energy Smart metering Smart water | Smart care Smart education Smart governance Smart planning Smart/open data | Smart infrastructure Structural health Smart buildings Smart irrigation Smart roads |



Networks

Networks of sensors gather and integrate data that can be used for various applications and city services.



Connectivity

Connectivity enables municipal officials to interact directly with the community and monitor & manage city infrastructure.



Open data

The local government committed to an open data philosophy and routinely shares operations and planning data with the public.



Communication For Smart Cities

PLC Value Proposition

► Functional

- Communication is over Power Feeders(LV & MV)
- Under ground, Overhead, extended connectivity
- No need of either fiber or Frequency Bands
- No need for dedicated dc supply
- No Line of Sight, spectrum availability, Right of way, Laying challenges

PLC(BPL) Value Proposition is combination of Technology , product development, Engineering and coupling

► Commercial

- No cost of Fiber and Optical Equipment's
- No cost towards Spectrum Fee for wireless
- Reduced TCO with respect to lease bandwidth charges /SIM subscription
- Saving on O&M
- R

Communication For Smart Cities

Communication Challenges

- ▶ Cost:
 - Fiber Based: Huge cost
 - Wireless: Spectrum Fee
- ▶ Operational
 - Fiber: Right of Way, Routes, Laying, -48 dc Power supply for Equipment
 - Wireless: Space and Rental for Masts, Line of Sight , Licenses , interference , frequency congestion
- ▶ Maintenance
 - Fiber: Repeated disruption due to cuts, Back up Power supply
 - Wireless: Interference, Performance optimization due to new construction, plantation etc

Communication For Smart Cities

Nessum Technology+ GE Vernova Development Value Position

► Functional:

- No requirement of Fiber or Frequency license
- Rapid deployment(Right of way, trenching, License allocation ,Space for Mast etc not required)
- Higher availability

► Commercial :

- Saving on account of Fire cables and or Frequency licenses
- No dedicated DC power supply
- Saving on O&M

► Technical

- Better noise immunity
- More efficient MAC layer and routing protocol to maximize throughput in larger networks
- Mutual interference mitigation for easier frequency planning
- lower downtime and faster network resilience schemes
- AES128 encryption
- Centrally controlled network registration
- Enterprise-class Cyber Security

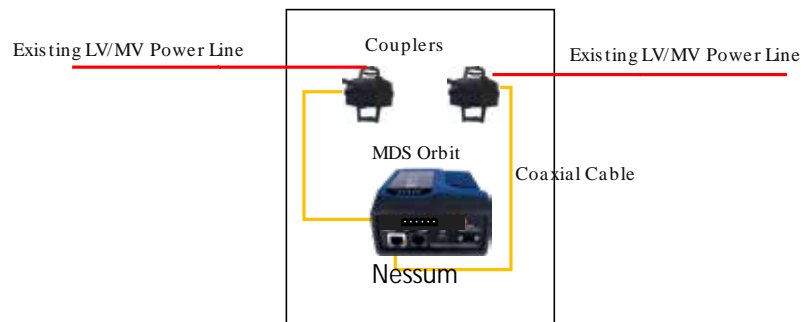
- Interoperability



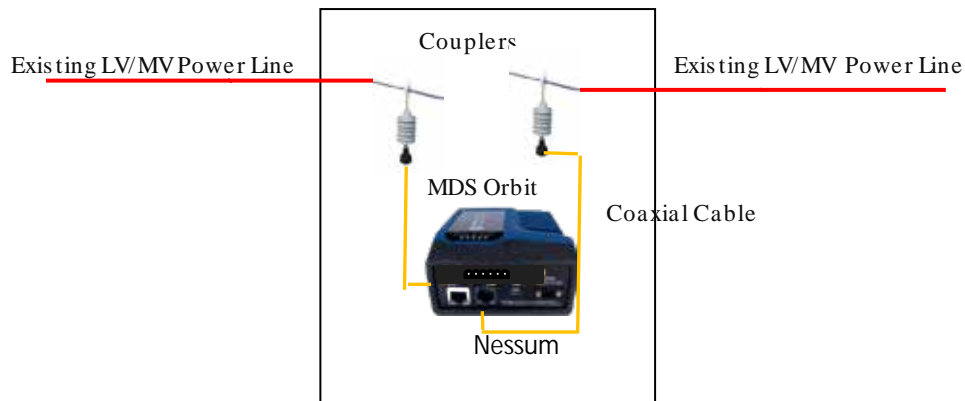
Communication For Smart Cities

Nessum Technology Solution

Under Ground Power Line-Inductive Coupling

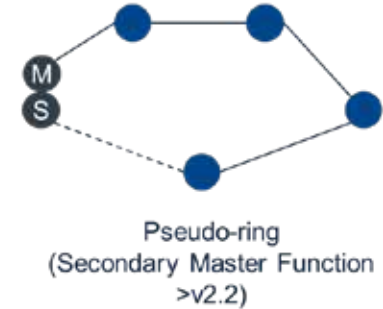
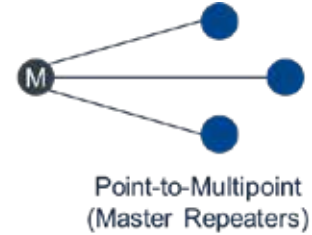
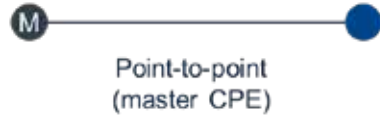


Overhead Power Line-Capacitive Coupling



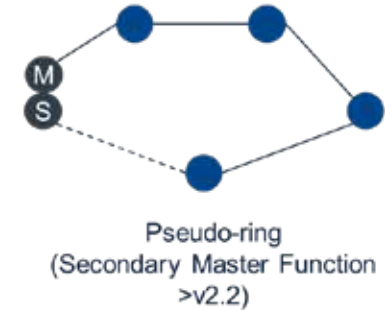
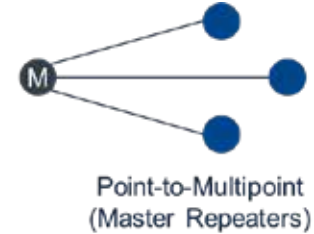
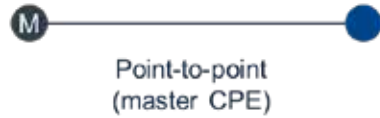
Communication For Smart Cities

Deployment Scenarios



Communication For Smart Cities

Deployment Scenarios



Conclusion

Field tested performance for data, Ip Telephony, Surveillance System, Remote operation etc like NMDC in India, Iberdola Spain, SICAE , Nice grid France, Stedin Netherlands

Nessum Technology based PLC communication system is highly reliable, economical and industry grade solution to meet Smart Cities communication Networks.